

Does the experience affect the knowledge about auxiliary portals in shoulder arthroscopy? A questionnaire study and review of the auxiliary portals

How well known are the auxiliary portals?

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**Abstract**  
Aim: This questionnaire study investigated the usability of need-driven portals from the safe zone instead of seconder-specific portals.  
Material and Methods: A face-to-face questionnaire concerning the anatomic localization of auxiliary specific secondary portals and in which pathology treatment they were used was conducted with 24 orthopedic surgeons. Seven specific seconder portals were included and four portals out of the safe zone were excluded from the study. Observers were divided into two groups according to their shoulder arthroscopy experiences and comparative evaluations were carried out.  
Results: SPSS 24. Ver Fisher-Exact test was used for statistical analysis and  $p < 0.05$  was accepted as significant. The existence of poor and medium results more often than good results in the study indicated that need-driven portals from the safe zone are more convenient. Additionally, the surgical experience was observed to have a more positive effect on the results. When the groups were statistically evaluated with the Fisher Exact Test in terms of anatomical localization and which pathology treatment they are used for, no significant difference was obtained ( $p = 0.059-0.444$ ), except for the Wilmington portal used in pathological treatment ( $p = 0.018$ ).  
Discussion: It has been observed that recalling and applying specific secondary portals in daily surgical practice is challenging. Instead, many surgeons find it appropriate to open a portal from a suitable area within the safe zone, with an inside-out or outside-to-inside technique, depending on the location and type of pathology.

**Keywords**  
Portal, Auxiliary Portals, Shoulder Arthroscopy, Experience, Questionnaire, Arthroscopic Surgery

Introduction

The anatomic spots to be identified before going into the joint in shoulder arthroscopy are acromion anterior-lateral-posterior borders, clavicle anterior and posterior, scapular spine anterior and posterior, acromioclavicular joint, and coracoid process. The basic portals used are the posterior, anterior, and lateral portals [1]. In addition to the basic ones, there are several specific seconder portals defined for the treatment of various pathologies. Among those, there exists an anterosuperior portal, anteroinferior portal, superior lateral portal, anterolateral portal, Wilmington portal, posterolateral portal, and posteroinferior (7 o'clock) portal, 5 o'clock portal, Neviaser portal, G portal, and transpectoral portal (Figure 1) [2]. Awareness of seconder-specific portals is noteworthy in various pathology treatments; yet, recalling and administering those properly can be challenging during operations. On the condition that it remains in the posterior portal and coracoid process lateral, the area up to 5 cm distal of acromion lateral is defined as a safe zone for portal entrances in shoulder arthroscopy (Figure 2) [3]. The purpose of this study is to research the usability of portals that are opened from the safe zone from the inside to the outside or from the outside to the inside, depending on the surgeon's decision, instead of the auxiliary specific secondary portals used in shoulder arthroscopy applications. No research has been done on this subject before. It was hypothesized that the localization of the seconder-specific portals and the awareness of which pathology treatment they are using would give positive results depending on the surgical experience.

Material and Methods

A face-to-face questionnaire designed by researchers was conducted with 24 orthopedic surgeons who perform shoulder arthroscopy operations. The 5 o'clock portal, the Neviaser portal, the G portal, and the transpectoral portal were excluded from the study as they were not located within the safe zone. The other identified seven auxiliary-specific seconder portals were included in our study. The observers who have been surgeons for at least three years (n=24) were divided into two groups those who regularly perform arthroscopic shoulder operations and those who do not. In the first group, there were 13 orthopedic surgeons who irregularly perform arthroscopic shoulder operations and 11 orthopedic surgeons who regularly perform arthroscopic shoulder operations (>50 operations/year) in the second group. In the questionnaire study, the names of the auxiliary specific secondary portals were given, and the anatomical localization and the options for the treatment of each pathology were mutually given. Moreover, the observers were asked to choose the correct option and the use of the specific secondary portal in the surgical practice was questioned. Which portals were used in the correct pathology treatment with the correct anatomical definition, and whether need-driven portals opened from the safe zone were used during the operation instead of specific secondary portals were investigated. The correct answer was marked as 1, and the wrong answer as 0. The correct answer rates were evaluated; 75%< was determined as a good result, 50-74% as a moderate, and 49%> as a poor

result. SPSS 24 version for Windows was used for statistical analysis. Categorical data between groups were analyzed by Fisher-Exact Test. P<0.05 was accepted as a significant value. **Ethical Approval** This study was approved by the Ethics Committee of Usak University Clinical Researches (Date: 2022-04-06, No: 62-62-06).

Results

The average age of the participant surgeons in the study (n=24) was 40.35±4.83 (32-51), and the average duration of the surgical experience was 11.04±4.72 (3-21) years. When examined in terms of anatomical localization, one portal had good (antero-inferior=75%) and the other six portals had moderate results (antero-superior=63%, supero-lateral=71%, postero-lateral=67%, 7 o'clock=71%, Wilmington=54%, antero-lateral=58%). When the groups were evaluated separately, five portals were moderate (antero-superior=54%, supero-lateral=62%, antero-inferior=69%, postero-lateral=62%, 7 o'clock=54%) and two portals were poor (Wilmington=38%, antero-lateral=46%) in the first group; 3 portals were good (supero-lateral=82%, antero-inferior=82%, 7 o'clock=91%), and four portals were moderate (antero-superior=73%, postero-lateral=73%, Wilmington=73%, antero-lateral=73%) in the second group (Figure 3). When evaluated in terms of which pathology treatment they are used for, two portals had moderate (supero-lateral=54%, antero-inferior=54%) and five portals had poor results

Table 1. Anatomic Localizations

	Group 1 (less experience) n:13	Group 2 (experienced) n:11	p value
Antero-superior (incorrect/correct)	6.7	3.8	0.300
Supero-lateral (incorrect/correct)	5.8	2.9	0.264
Antero-inferior (incorrect/correct)	4.9	2.9	0.410
Postero-lateral (incorrect/correct)	5.8	3.8	0.444
Seven o'clock (incorrect/correct)	6.7	1.10	0.059
Wilmington (incorrect/correct)	8.5	3.8	0.102
Anterolateral (incorrect/correct)	7.6	3.8	0.185

Table 2. Which Pathology Treatment

	Group 1 (less experience) n:13	Group 2 (experienced) n:11	p value
Antero-superior (incorrect/correct)	8.5	5.6	0.353
Supero-lateral (incorrect/correct)	7.6	4.7	0.329
Antero-inferior (incorrect/correct)	8.5	3.8	0.102
Postero-lateral (incorrect/correct)	9.4	4.7	0.115
Seven o'clock (incorrect/correct)	9.4	5.6	0.223
Wilmington (incorrect/correct)	12.1	5.6	0.018
Anterolateral (incorrect/correct)	9.4	5.6	0.223

(antero-superior=46%, postero-lateral=46%, 7 o'clock=42%, Wilmington=29%, antero-lateral=42%). When the groups were evaluated separately, while all seven portals had poor results (antero-superior=38%, supero-lateral=46%, antero-inferior=38%, postero-lateral=31%, 7 o'clock=31%, Wilmington=8%, antero-lateral=31%) in the first group, seven portals in the second group had moderate results (antero-superior=55%, supero-lateral=64%, antero-inferior=73%, postero-lateral=64%, 7 o'clock=55%, Wilmington=55%, antero-lateral=55%) (Figure 3). When the groups were statistically evaluated with the Fisher Exact Test in terms of anatomical localization and which pathology treatment they are used for, no significant difference was obtained ( $p=0.059-0.444$ ), except for the Wilmington portal used in pathological treatment ( $p=0.018$ ) (Table 1,2). It was determined that four (17%) of the 24 participant surgeons utilized specific secondary portals as standard in their surgical practices whereas the other 20 (83%) surgeons generally used the safe zone after determining



Figure 1. Portals used in shoulder arthroscopy



Figure 2. Safe zone for portals used in shoulder arthroscopy

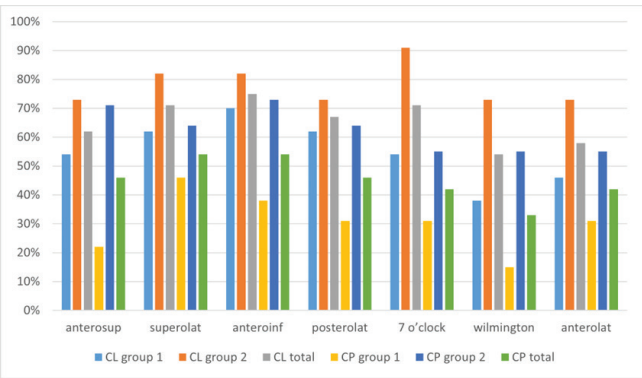


Figure 3. Results of the questionnaire

the appropriate portal localization. Of the four surgeons using specific secondary portals as standard, one was from the less experienced group and the other three were from the second group.

Discussion

There exist secondary specific portals defined to help the treatment of various pathologies in addition to primary portals in shoulder arthroscopy applications. The anatomical localization of these portals and which pathology treatment they are used for are barely recalled by many surgeons during the operation [4]. The literal approach is to quickly review these portals during preoperative planning and determine the most appropriate ones for the patient's pathology [5].

Anteroinferior portal is located just lateral to the coracoid. The anterosuperior and anteroinferior portals provide the finest visibility for treatments affecting the anterior capsule, and their usage allows for surgical triangulation in the anterior glenohumeral joint. It provides good visibility of the glenoid neck and inferior; it is used in anterior labral and IGHL repairs and it opens with the inside out technique. The cephalic vein and the axillary nerve are the structures at risk. Placement of anchors via the trans-subscapularis portal has been shown to provide a safe alternative method with better positioning of the lowest anchor compared to traditional AI [6].

The anterosuperior portal is located right off the acromion's anterolateral border. Starting at the midpoint of the coracoid and the acromion, an outside-in technique is used to form the anterosuperior portal [2]. It remains medial to the superolateral portal, and it is used in cuff repair, SLAP repair, and subacromial decompression. During superior labral anterior-posterior (SLAP) repair, the anterosuperior portal also provides a suitable angle for anchor placement on the anterosuperior glenoid. It opens with an outside-to-inside technique. Though the risk is less than the anteroinferior portal, the cephalic vein and axillary nerve are the structures at risk.

On a line traced from the acromion to the coracoid, the superolateral portal is located just lateral to the acromion. It provides direct visualization of the anterior glenoid and it is especially used in cuff repair as well as helping labral stabilization. It opens with an outside-to-inside technique [7]. The anterolateral portal incision is performed 2 to 3 cm distal to the lateral margin, aligned with the anterior acromion. SLAP is used in the treatment of subacromial impingement and acromioclavicular joint pathology. The axillary nerve is at risk if it remains inferior. Recently, Aouad et al. They concluded that a single anterolateral working portal may be sufficient for rotator cuff repair, acromioplasty, distal clavicle excision, and long head biceps tenodesis [8].

The portal of Wilmington is located 1 cm anterior and 1 cm lateral to the posterolateral corner of the acromion. It is effective in SLAP and also in posterior Bankart treatment by providing anchor placement at a 45-degree angle to the posterosuperior glenoid [9].

The posterolateral portal is located 2-3 cm below the posterolateral corner of the acromion. It is used in subacromial decompression and acromioplasty; additionally, it helps in cuff repair and posterior labral repairs. It opens with an outside-to-

inside technique. The axillary nerve is the structure at risk. This portal can also be used for viewing in acromioplasty and rotator cuff repairs [10].

The 7 o'clock (posteroinferior portal) portal is located 2-3 cm inferior to the posterior portal. Davidson has shown that it can be opened inside-out or outside-to-inside [11]. It helps in loose body removal and posteroinferior labral fixation. The suprascapular nerve and artery, axillary nerve, and posterior circumflex artery are neurovascular structures at risk.

The portal of Neviaser is in the sulcus between the posterior of the acromioclavicular joint and the scapular spine. It is used for arthroscopic clavicle distal end resection and anterior supraspinatus repair. A recent study has shown that this portal is also a valid option for antegrade nailing of humeral fractures [12]. A cadaveric study has shown that the minimum distance between the suprascapular nerve and an instrument directed towards the acromioclavicular joint through this portal is 18.5 mm [13].

The 5 o'clock portal is 1 cm inferior to the anteroinferior portal and is accessed via the subscapularis tendon. It is used in low anchor placement in anterior shoulder instability. It is opened with the inside-out technique. Some authors do not recommend its use due to its proximity to neurovascular structures and its risk of cartilage [7]. Although a more medial variation of this portal is not superior to the standard approach, the standard approach has also been recommended for HAGL repair [14].

The G (suprascapular nerve portal) portal is located 2 cm medial to the Neviaser portal, between the clavicle and the scapular spine. It was defined by Lafosse [5]. It is used in suprascapular nerve decompression by cutting the superior transverse scapular ligament. It is opened with an outside-to-inside technique. The suprascapular nerve and artery are the structures at risk.

The transpectoral portal was defined by Dunn for use in graft and screw placement in arthroscopic Latarjet operation. It is opened with an outside-to-inside technique. It is located medial to the coracoid [15].

Instead, auxiliary portals that open from the inside to the outside or from the outside to the inside from the area determined as the safe zone are frequently preferred. The results of our questionnaire indicated that the poor and moderate results were more in number than the good results, which showed that specific secondary portals are less useful in daily life.

Need-driven portals opened from the safe zone are utilized by many surgeons in daily practice. When auxiliary portals opened from the safe zone were retrospectively examined, they were observed to show similarities with specific secondary portals.

Defined specific secondary portals have been in successful use in shoulder arthroscopy operations for a long time. However, where the anatomical localization of each portal is during the operation and which pathological repair it is used for has been an ongoing concern. For this reason, portals that are opened from the inside to the outside or from the outside to the area that the surgeon needs during the operation are practical and useful.

The seven portals included in the study are located in the safe zone. These portals, which are mostly found to be sufficient in arthroscopic shoulder operations, have a low risk of neurovascular injury. The 5 o'clock portal, the Neviaser portal,

and the G portals, which are excluded from the study because of being outside the safe zone, are used less frequently and the risk of neurovascular injury is higher.

The localization of specific secondary portals is determined by a certain distance from anatomical landmarks. These distances can differ between a thin and short patient and a fat and tall patient. As a result of the prolongation of the operation length, the determination of these anatomical landmarks is even more difficult although the appropriate drawings are preoperatively made. Determining the most suitable region by using a spinal needle during the operation and opening the portal prevents this situation in the treatment of pathology. When considering that their clinical training is within a certain standard framework, the main limitation of the study is that not all surgeons are from separate clinics.

### Limitation

Due to the design of the study, surgeons were asked to show portal localizations in writing, and although some surgeons did not know the exact definition, they could better show the correct localization on the model or the patient. The absence of a similar study in the literature eliminated the possibility of comparing the results of our study with literature information.

### Conclusion

It has been observed that recalling and applying specific secondary portals in daily surgical practice is challenging. Instead, many surgeons find it appropriate to open a portal from a suitable area within the safe zone, with an inside-out or outside-to-inside technique, depending on the location and type of pathology.

### Scientific Responsibility Statement

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

### Animal and Human Rights Statement

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.*

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### Conflict of Interest

*The authors declare that there is no conflict of interest.*

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